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Conference Report

How Emergency Physicians Think

Highlights of the Fourth Mediterranean Emergency Medicine Congress (MEMC IV)

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Patrick Croskerry, MD, PhD, Professor of Emergency Medicine, Dalhousie University, Halifax, Nova Scotia, Canada, describes the impact of cognitive and affective error in emergency medicine clinical decision making. He evaluates patterns of thinking that may lead to identifiable types of error by emergency physicians (EPs). Such evaluation of these thinking processes may have the ability to influence how EPs conduct morbidity and mortality conferences, and lead to improved approaches to patient care when reviewing adverse outcomes in the emergency department (ED).

Introduction

"The emergency department is a natural laboratory for the study of error," stated Dr. Croskerry. Organizations, committees, and specific studies have focused on the occurrence of errors in hospital practice. Croskerry suggested that the ED, with its multiple interacting processes in the context of high degrees of uncertainty, is a uniquely error-prone environment. The underlying patterns of thinking that can lead to misdiagnosis are crucial for EPs to understand and incorporate into training programs.

Croskerry's recent study^[1] on critical thinking and decision making categorized errors seen in EDs in the United States, Canada, and Australia. He was able to identify 25 processes that contribute to errors. Approximately half of these processes were individual mistakes -- faulty decision making, mistriage, and cognitive and emotional biases -- and all involve the way that EPs think. Some errors are related to the internal thought processes of individual physicians; some occur within the interactions between different caregivers; and still others occur in the interactions between caregivers and systems and technology. Croskerry's message focuses on the recurring patterns of thought processes that may lead us astray.

Why is the ED especially error-prone? The answers will not surprise any emergency caregiver. Most patients are strangers; they present with atypical manifestations of the vast spectrum of illnesses seen in the ED (approximately 10,000 possible diagnoses), and decisions relating to their care must be made within a succinct period of time. The patient's history may be sparse or unobtainable, and definitive studies are often not available for potentially life-threatening conditions. The EP must make multiple decisions on a number of patients simultaneously, with differing degrees of acuity. The density of decision making is greater in the ED than any other area of medicine, perhaps, suggests Croskerry, greater at a particular instant than any other profession.

Having to make many decisions in a context of limited and ambiguous data, EPs must recognize patterns in their thought processes and impediments to correct their reasoning. As an example, Croskerry discusses the "signal-to-noise ratio" in the ED. A high signal-to-noise ratio occurs when the presenting symptoms are clear and typical, and EPs do not need to struggle to make a diagnosis (eg, shingles, shoulder dislocation, laceration). Although there are always pitfalls in making such straightforward diagnoses, the path to treatment is relatively clear. On the other hand, low signal-to-noise ratios occur in symptoms that are vague in presentation. A headache may be benign or

potentially catastrophic, but classic features that point to a life-threatening condition may be missing or hidden in the "noise," resulting in a low signal. Chest pain, abdominal pain, dyspnea, weakness, and dizziness will all often have a low signal-to-noise ratio.

Because dangerous medical conditions often present vaguely and with an inadequate history or background, EPs need to be highly aware of the danger of "attributional judgments," which involve premature labeling and/or categorizing patients and which can solidify a mistaken diagnosis. This potential for "premature closure" is particularly problematic when EPs allow their own emotional reactions to the patient to influence decision making. For example, a patient who is intoxicated and obnoxious may not get the careful evaluation that he or she needs. On the other hand, the physician may unconsciously avoid trying to find something serious in a well-liked or admired patient.

Error-Producing Conditions in the ED

As in all organizations, there are system errors and intrinsic errors in the ED. System errors pertain to design, both physical and process design. The physical design of the ED, because of the varying patient loads, is necessarily imperfect. Design of specific equipment may not match every need at every moment. Adequate lines of vital supplies depend on managers with whom individual physicians may or may not have any direct contact. Further, all of these factors may occur in the context of ED overcrowding and boarding, unpredictable patient surges, high noise levels (acoustic and otherwise), and inadequate staffing. These issues, only some of which are even minimally correctable, are inherent to the practice of emergency medicine, and many errors can be traced back to the working conditions and environment in the ED. For those issues that can be addressed, protocols and proactive management can help move toward their resolution.

Within the disorder of a busy ED, and the potential for system errors, physicians must also deal with the potential for intrinsic errors. These sources of error include:

- High levels of diagnostic uncertainty;
- "Decision density," or the volume of decisions that are made in a given amount of time;
- A high amount of cognitive load needed to process a large volume of data;
- Narrow time windows for patient assessment;
- Multiple care transitions for any given patient; and
- A multitude of interruptions and distractions throughout the thought process.

This list is compounded by "surge phenomena" (unpredictable sharp increases in patient volume), physician fatigue, and sleep cycle disturbances as well as novel and unpredictable conditions, such as unplanned illnesses or absences that reduce staffing or hospital disasters, including chemical exposures or unforeseen contaminations within the hospital.

Urgency of Decision Making

Every case seen in the ED requires a hierarchy of decisions, and each of these must be accompanied by a second analysis to determine whether the action is to be expedient or delayed. Does the patient need immediate airway control, or can we use a temporizing measure (noninvasive ventilation)? Each decision must also be judged as to whether it is major or minor and assigned a priority level. If a diagnosis is missed, will it have catastrophic results? Is the decision clinical or managerial?

How Well Do EPs Think?

Dr. Croskerry asserted that EPs are not as accomplished at thought processes as they may perceive themselves to be. This assertion is not based on the quality of the decisions made in the challenging environment of a busy ED, but rather on the nature of emergency medicine and the fact that EPs do not follow patients or receive a great

amount of feedback with regard to their diagnosis and patient work-ups. This "black box approach" inherent in the practice of emergency medicine makes it difficult to gain insight and develop critical thinking skills in either training or in practice.

Diagnostic Error

Diagnostic error is the most important source of adverse events in the ED, where there is a discrepancy between clinical diagnosis and postmortem findings 20% to 40% of the time.^[2] Overall, according to Croskerry, 50% of closed malpractice claims are due to misdiagnosis. According to a recent study of malpractice claims due to diagnostic failure, 48% resulted in serious harm and 39% in death.^[3] It is imperative that the emergency medicine community understand why misdiagnosis occurs, and which underlying patterns of thinking can lead to misdiagnosis.

One method of clinical decision making is the "cookbook" approach, in which EPs employ algorithms or clinical decision rules in order to arrive at a diagnosis. This approach is useful and often necessary in high-stress moments, as in with clear emergencies, such as multiple trauma or ventricular arrhythmia. However, algorithms take the thinking out of decision making, which may be the safest approach in these situations.

On the other hand, the majority of ED decision making comes under what cognitive psychology defines as "dual-process thinking." Croskerry refers to this type of decision making as a combination of system 1 and system 2 decisions. System 1 decisions are intuitive, similar to "gut feelings." This thinking is heuristic, in that it is characterized by mental shortcuts and tends to be reflexive and automatic. The experienced physician will often recognize patterns of disease presentation, rapidly come to diagnostic closure, and proceed with a treatment plan. Although system 1 thinking is efficient, it is not reliable. Predictive power is not strong and there may be an emotional component that influences the conclusion.

System 2 thinking, in contrast, is analytic, slow, and rational. There is less opportunity for error; predictive power is strong; and emotional components are minimized.

Why shouldn't all ED decision making be system 2? The answer stems from the same challenges outlined earlier; EM practice requires rapid decision making in a constantly changing environment while caring for multiple patients. System 2 thinking is time-consuming and resource-intensive. If all patients were managed with system 2 decision making, the ED would grind to a halt. Further, taking this studied, step-by-step approach with critical patients who need immediate intervention and not a slow, methodical work-up would be dangerous.

The key to effective emergency medicine thinking is to combine systems 1 and 2 and achieve dual-process thinking, a balanced blend that adjusts to contingencies of clinical circumstances. System 1 can override system 2 thinking, and vice versa. This override is sometimes necessary, but sometimes inappropriate. Spending too much time in system 2 is inefficient, but too much reliance on pattern recognition can quickly lead to diagnostic errors.

In order to achieve dual-process thinking, Croskerry emphasized, the solution is to provide formal training in critical thinking. Although this is appropriate and important for all physicians, it is particularly pertinent to emergency practice. EPs need to understand how to make fast decisions while understanding the pitfalls and cognitive biases that can lead us astray. This "metacognition" or thinking about the way that we think will help us navigate when to trust system 1 decision making vs when to step through system 2. In the end, the right balance should work to minimize our mistakes and improve patient care.

Practical Suggestions to Improve the Way That EPs Think

1. *Reduce reliance on memory:* Use cognitive aids, handheld devices, mnemonics, and algorithms.
2. *Learn to use metacognition for a reflective approach to problem solving:* This entails the ability to step back from the immediate problem to examine the way the thought process has led to the conclusion.
3. *Optimize ambient work conditions:* Understand the way in which thought processes can be impaired by noise levels, sleep deprivation, staffing patterns, and lack of accessible treatment protocols.
4. *Provide clinical decision support and ongoing feedback:* This is necessary to understanding how cognitive

errors occur and how to use dual-process thinking.

References

1. Croskerry P. Critical thinking and decisionmaking: avoiding the perils of thin-slicing. *Ann Emerg Med*. 2006;48:720-722. [Abstract](#)
2. Brennan TA, Leape LL, Laird NM, et al. Incidence of adverse events and negligence in hospitalized patients. *N Engl J Med*. 1991;324:370-376. [Abstract](#)
3. Kachalia A, Gandhi TK, Puopolo AL, et al. Missed and delayed diagnoses in the emergency department: a study of closed malpractice claims from 4 liability insurers. *Ann Emerg Med*. 2007;49:196-205. [Abstract](#)

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